EXHIBIT K

> With a lesser interleave depth, additional sessions may be supported with the same size buffer. With a larger buffer, additional session may be supported. (Fadavi-Ardekani 6:66-7:33)

> The IDIM may also be used in a ping-pang fashion by the FCI and the DSP core based on the virtual clock cycle. For 60 example, between the events of the virtual clock signal transition and the rising edge of the TX processes are complete signal (TX_Complete 324), the DSP core may load new DMT frames of RX data to a portion of the IDIM used as de-interleave memory while the FCI is using a portion of the IDIM as interleave memory. Between the events of TX_Complete 324 and signal that all RX processes are complete (RX_Complete 328), the DSP core can read TX data from the portion of the IDIM used as interleave memory while FCI is accessing the portion of the IDIM used as de-interleave memory. (Fadavi-Ardekani 8:58-9:3)

311.   Thus, the IDIM is a common memory used by at least the two functions of interleaving and deinterleaving. A portion of the memory can be used by either one of the functions as the random access memory can be flexibly allocated to handle a variety of interleaver depths (See, e.g., Fadavi-Ardekani 7:25-32 and VDSL1 Table 8-2) as well as both symmetric and asymmetric services in VDSL (See, e.g., VDSL1 summary and Fadavi-Ardekani 4:18-21).

C.   **VDSL1 (ITU-T Standard G.993.1)**

312.   G.993.1 (NOK00078763; COMMSCOPE008135) is entitled "Very high speed digital subscriber line transceivers" and was officially approved on June 13, 2004, by the ITU-T Study Group 15. G.993.1 at Cover; *id.* at i. Drafts of G.993.1, including a final draft circulated for consent, were made available to and disseminated amongst ITU members prior to the June 2004 meeting. In fact, a final draft of G.993.1 was disseminated and consented to at the April 2004 Geneva meeting. Because no comments were received, that draft of G.993.1 entered approved status on June 13, 2004. I thus understand G.993.1 to be prior art as of at least June 13, 2004, and thus prior art to the Family 3 Patents. I further understand that TQ Delta previously admitted that G.993.1 was prior art to the Family 3 Patents, including the '882 and '048 Patents. *See 2Wire*, No. 13-cv-

01835-RGA, ECF. No. 1142, at Ex. 1, p. 2, 4 (explaining that the "following facts are admitted by the parties and require no proof," including that "ITU-T Recommendation G.993.1, entitled 'Very high speed digital subscriber line transceivers,' is prior art to the Asserted Family 3 patents").

313.   For example, a draft version of G.993.1 was disseminated and made available to ITU members as SS-046 and SS-R11 in connection with the January 2004 meeting in Singapore. Additionally, prior to its official approval at the June 2004 meeting, the draft G.993.1 standard was disseminated amongst and made available to ITU members as C-107 and TD 71 (PLEN) for consent in connection with the April 2004 Geneva meeting. I understand that TD 71 (PLEN), which was submitted for consent, was ultimately approved without comment at the June 2004 meeting. The agenda for the January 2001 meeting in Singapore, SS-001, shows that the documents SS-046 and SS-R11 were slated for discussion at that meeting. The document list for the January 2004 meeting shows that SS-046 was available to ITU members through the ITU website as of no later than May 5, 2004, and the document was further indexed to the G.vdsl area and findable by descriptive name "Proposed draft for revision of G.993.1." The document list for the April 2004 meeting shows that C-0107 and TD 71 (PLEN) were available to ITU members through the ITU website as of no later than May 13, 2004, and the documents were further indexed to the G.vdsl area and findable by descriptive names "Draft revised Recommendation G.993.1" and "Draft revised Recommendation G.993.1 (for consent)."

314.   Thus, the G.993.1 draft versions SS-046, SS-R11, C-0107, and TD 71 (PLEN) were all made available to ITU members prior to the June 2004 ITU meeting where G.993.1 was approved. Each of these draft versions include substantially all of the material that I have relied on in the G.993.1 document including, for example, the description of Reed-Solomon coding in Section 8.3, interleaving in Section 8.4, and the description of configuration messages in Section

12 including the description of R-MSG2 in Section 12.4.6.3.1.1. The documents are very similar throughout with minor small differences except for differences in material near the end of the documents. For example, TD 71 PLEN includes the four-page Appendix IV: 8.625 kHz Tone Spacing (Informative) at the end that is not present in C-0107 or SS-046. C-0107 includes an "Attachment for G.994.1" at the end that is not present in TD-71 PLEN. Similar to C-0107, SS-046 includes "Annex J Handshake procedure for VDSL (normative)" towards the end that includes similar information to the "Attachment for G.994.1" found at the end of C-0107. None of these minor differences are related in any way to the teachings I have relied on from G.993.1. I further note that the document TD 71 PLEN includes the notation "(for consent)" in the title indicating that this is the version that was proposed at the April 2004 ITU-T SG15 meeting.

315.   Evidence regarding the availability of these documents is shown in the Issues List TD-WP1-0021 for G.vdsl and G.vdsl2 from April 2004. In particular, TD-WP1-0021 lists a series of actions (shown below) taken between January 2004 and March 2004 regarding documents SS-046 and C-107. For example, TD-WP1-0021 states that "SS-046 with editorial revisions shall be submitted as a White Contribution to the April 2004 SG15 meeting proposing a revised recommendation G.993.1" and "MC-124R1 contained the agreed changes to C-107 (Draft revised G.993.1) and will be uploaded to the TSB prior to the Geneva meeting."

| 1.12 | Agreed 20-Jan-2004 | Q4/15 agrees to develop a VDSL Recommendation for consent in April 2004 or sooner with full text specification for DMT in the main body and full text specification for QAM in a normative Annex, with the following in the Scope section:
It has been agreed in the ITU-T to develop a subsequent VDSL2 Recommendation that specifies only DMT modulation, and is based on ITU Rec. G.993.1-2004 (VDSL) and ITU Rec. G.992.3 (ADSL2). | SS-022 |

1.13	Agreed 23-Jan-2004	SS-046 with editorial revisions shall be submitted as a White Contribution to the April 2004 SG15 meeting proposing a revised Recommendation G.993.1. Prior to the submission, the editor will perform editorial revisions and notify the committee by the email reflector for review.	SS-046
1.13.1	Agreed 23-Jan-2004	The accepted resolutions in SS-087 shall be applied to the draft revised Recommendation G.993.1. Item #13 and #18 are also accepted. The note in point 21 shall be modified to be: "For system using QAM implementation the DMT specific aspects of this annex is not required."	SS-046
1.13.2	Agreed 23-Jan-2004	Table 6-2 will be replaced with Figure-5(a)/SS-060. Table 5(b) and the picture will be placed in an informative appendix.	SS-046
1.13.3	Agreed 12-Mar-2004	MC-124R1 contained the agreed changes to C-107 (Draft revised G.993.1) and will be uploaded to the TSB prior to the Geneva meeting.	MC-042, MC-053, MC-124

(TD-WP1-0021 at 4-5)

316.   As further evidence, the documents list SG15/Q4 for the April 2004 Geneva meeting lists the document C-0107 as the first item on the G.vdsl agenda.

G.vdsl

Num.	Source	Area	Title	Informal Filename	ITU filename
C-0107	G.vdsl Associate Rapporteur	G.vdsl	Draft revised Recommendation G.993.1	- N/A -	T01-SG15-C-0107R1-040420b.doc

Brief Agenda:

Area		Contribution Numbers
Admin	details	D-1252, TD-PLEN-0003, TD-PLEN-0016, TD-PLEN-0017, TD-PLEN-0018, TD-PLEN-0019, TD-PLEN-0020, TD-PLEN-0057, TD-PLEN-0086, TD-PLEN-0087, TD-PLEN-0094, TD-PLEN-0095, TD-PLEN-0096, TD-PLEN-0097, TD-PLEN-0105, TD-GEN-0001, TD-GEN-0002, TD-GEN-0003, TD-GEN-0004, TD-GEN-0005, TD-GEN-0006, TD-GEN-0007, TD-GEN-0008, TD-GEN-0013, TD-GEN-0014, TD-GEN-0015, TD-GEN-0016, TD-GEN-0017, TD-GEN-0018, TD-GEN-0019, TD-GEN-0020, TD-GEN-0021, TD-GEN-0022, TD-GEN-0023, TD-GEN-0024, TD-GEN-0025, TD-GEN-0026, TD-GEN-0027, TD-GEN-0028, TD-GEN-0029, TD-GEN-0030, TD-GEN-0031, TD-GEN-0032, TD-GEN-0033, TD-GEN-0034, TD-GEN-0035, TD-GEN-0036, TD-GEN-0037, TD-GEN-0038, TD-GEN-0040, TD-GEN-0041, TD-GEN-0042, TD-GEN-0043, TD-GEN-0058, TD-WP1-0001, TD-WP1-0003, TD-WP1-0004, TD-WP1-0005, TD-WP1-0008, TD-WP1-0009, TD-WP1-0015, TD-WP1-0023,
IPR	details	
G.shdsl.bis	details	
G.vdsl	details	C-0107, D-0993, D-0994, D-1015, D-1016, D-1018, D-1019, D-1020, D-1021, D-1023, D-1024, D-1025, D-1037, D-1038, D-1039, D-1041, D-1042, D-1045, D-1046, D-1047, D-1048, D-1049, D-1050, D-1051, D-1052, D-1053, D-1054, D-1060, D-1061, D-1062, D-1067, D-1068, D-1069, D-1079, D-1118, D-1144, D-1145, D-1151, D-1156, D-1180, D-1185, D-1186, D-1187, D-1188, D-1202, D-1219, D-1255, TD-PLEN-0071, TD-WP1-0002, TD-WP1-0007, TD-WP1-0020, TD-WP1-0021, TD-WP1-0022, TD-WP1-0028,
G.ort	details	
G.voice	details	
G.bond	details	D-1063, D-1119, TD-WP1-0024, TD-WP1-0026,

317.   In addition to my review of these documents, I have spoken with ADTRAN's engineers Richard Goodson and Kevin Schneider. Dr. Schneider and Mr. Goodson informed me that both were involved in ADTRAN's standardization activities, including ADTRAN's activities as an ITU member. Mr. Goodson informed me that he attended ITU meetings during the time period covered by the meetings I have referenced above and continuing into the time period of the alleged invention. He confirmed that the established practice of the ITU (including Study Group 15 that was developing the G.993.1 standard) was that as standard approached approval, drafts of the standard are made available through the ITU Telecommunication Information Exchange Service (TIES) website, which is how the documents SS-046, C-107-R1, and TD 71 PLEN were made

available. Such documents are available to any ITU Sector Member companies and Associate Member companies in the appropriate technical area. As described on the ITU website https://www.itu.int/en/about/Pages/default.aspx, the ITU today is a community of more than 20,000 professionals and includes 193 Member States as well as some 900 companies. In 2004, the ITU included 189 Member States and 730 companies including 640 that were Sector Members. https://web.archive.org/web/20040627044216/http:/www.itu.int/members/index.html.

318.   Mr. Goodson stated that in addition to documents such as SS-046, C-107-R1, and TD 71 PLEN being available to ITU members through the website, meetings about DSL standards where these documents were discussed prior to the time of the alleged invention were often "standing room only" because those engineers who were interested in implementing DSL technologies wanted to be in the room as decisions were being made in the adoption of a standard.

319.   I also spoke with Nokia's engineers Frank Van der Putten, Danny Van Bruyssel, and Paul Spruyt. Mr. Van Bruyssel and Mr. Van der Putten informed me that they were present at the April 2004 meeting where G.993.1 was consented to and the June 2004 meeting where G.993.1 was approved. They informed me that, after approval, the document would undergo no substantive changes. Mr. Van Bruyssel also informed me that, on May 13, 2004, he received an email through an ITU, Study Group 15 email distribution list—tsg15g4@itu.ch. That email pointed to him to the draft version of G.993.1 for consent, which was ultimately approved without comment.

320.   Nokia's engineers also informed me that the standard practice of the ITU, Study Group 15, was to access drafts of recommendations, and contributions, on the TIES website. They explained that these "ITU documents are effectively available to anyone that would be interested in getting them." Based on my conversation with them, and my own independent assessment, I understand that ITU membership is broad and can be achieved in a number of different capacities,

and is intended to include anyone interested in and possessing ordinary skill regarding DSL standards. I also understand that, outside of receiving a membership, one may gain access to ITU documents as a guest of an ITU member.

321.   Furthermore, the G.993.1 standard that was approved in June 2004 shares many concepts with the ETSI VDSL1 standard TS 101 270-2 that bears a copyright date of 2003 and was published on ETSI's website to the public at large in July 2003 (specifically July 24, 2003, according to the Work Programme details for the document available through the ETSI website: https://portal.etsi.org/webapp/workprogram/Report_WorkItem.asp?WKI_ID=11828.) The shared concepts found in ETSI VDSL1 that are included in and relevant to my invalidity analysis include support and symmetric and asymmetric rates by a VDSL transceiver (e.g., ETSI VDSL1 § 5.2.5.1.1), the use of Reed-Solomon Coding (e.g., ETSI VDSL1 § 6.4.2), the use of convolutional interleaving (specifically the triangular implementation of convolutional interleaving) (e.g., ETSI VDSL1 §§ 6.4.3.1, 6.4.3.2), and the initialization process (including specifically the O-MSG2, R-MSG2, and "maximum interleaver memory" field used in my analysis) (e.g., ETSI VDSL1 §§ 8.2.1, 8.2.4, 8.2.6 (generally), 8.2.6.2.1.1, 8.2.6.2.1.2, 8.2.6.2.1.3, 8.2.6.3.1.1, 8.2.6.3.1.2, 8.2.6.3.1.3, 8.2.6.3.1.4).   For these concepts, ETSI VDSL1 includes substantially the same teachings, and indeed often identical content for concepts like RS coding, interleaving, and the initialization process, as described in the version of ITU 993.1 that was approved in June 2004.

322.   I note that the connection between ETSI's VDSL1 standard TS 101 270-2 and ITU VDSL standards was documented, for example, in TD-WP1-0002.   TD-WP1-0002 is a letter associated with the April 2004 ITU meeting in Geneva from ETSI TM6 Chairman Manfred Gindel to Paolo Rosa of the ITU describing a compromise proposal that would "enable ITU-T SG15Q4 to develop a VDSL specification similar to TS 101 270-2, but with DMT in the main body and QAM

in a normative Annex, and also to start work on VDSL2 with objectives similar to those agreed in

ETSI." G.993.1 is in fact a VDSL specification similar to TS 101 270-2, but with DMT in the main

body and QAM in a normative Annex:

> We understand that a compromise proposal described in an informal document named "VDSL a way forward", and discussed at the recent Q15 meeting held in Geneva during October 2003, exists. This could enable ITU-T SG15Q4 to develop a VDSL specification similar to TS 101 270-2, but with DMT in the main body and QAM in a normative Annex, and also to start work on VDSL2 with objectives similar to those agreed in ETSI. TM6 supports this compromise and we hope that it can be achieved in the very near future. (Excerpt from TD-WP1-0002)

323.   The document SS-022R3 associated with the Juanry 2004 ITU meeting in Singapore

entitled "VDSL: A way forward" indeed includes the agreement to "develop a VDSL

Recommendation for consent in April 2004 or sooner with full text specification for DMT in the

main body and full text specification for QAM in a normative Annex," and that recommendation is

what was approved in June 2004 as G.993.1.   The Issues List for G.vdsl and G.vdsl2 from the

January 2004 meeting in Singapore, SS-U11R3 further documents the agreement described in

"VDSL: A way forward" and indicates that a revised version of SS-046 (one of the three draft

versions of G.993.1 I discussed above) will be the VDSL recommendation proposed for consent at

the April 2004 SG15 meeting.

1.12	Agreed 20-Jan-2004	Q4/15 agrees to develop a VDSL Recommendation for consent in April 2004 or sooner with full text specification for DMT in the main body and full text specification for QAM in a normative Annex, with the following in the Scope section: It has been agreed in the ITU-T to develop a subsequent VDSL2 Recommendation that specifies only DMT modulation, and is based on ITU Rec. G.993.1-2004 (VDSL) and ITU Rec. G.992.3 (ADSL2).	SS-022
1.13	Agreed 23-Jan-2004	SS-046 with editorial revisions shall be submitted as a White Contribution to the April 2004 SG15 meeting proposing a revised Recommendation G.993.1. Prior to the submission, the editor will perform editorial revisions and notify the committee by the email reflector for review.	SS-046
1.13.1	Agreed 23-Jan-2004	The accepted resolutions in SS-087 shall be applied to the draft revised Recommendation G.993.1. Item #13 and #18 are also accepted. The note in point 21 shall be modified to be: "For system using QAM implementation the DMT specific aspects of this annex is not required."	SS-046
1.13.2	Agreed 23-Jan-2004	Table 6-2 will be replaced with Figure-5(a)/SS-060. Table 5(b) and the picture will be placed in an informative appendix.	SS-046

324.   These documents provide further evidence that the teachings I have relied on from G.993.1 approved in June 2004 were published and publicly known no later than June 2004 because 1) substantially identical or identical teachings were published in ETSI VDSL1 in July 2003, 2) that publication was available to the public at large, 3) that publication and its contents were known by ETSI members that approved the ETSI VDSL1 standard prior to July 2003, and 4) the ETSI VDSL1 standard and its contents (including the substantially identical or identical teachings I have relied on from G.993.1) were known by, at a minimum, ITU members as indicated by the references to ETSI's VDSL1 standard during the development of G.993.1.

325.   Accordingly, I am informed that G.993.1 qualifies as prior art under at least pre-AIA 35 U.S.C. §102(a) because it was described in a printed publication in this or a foreign country before the earliest priority date for the Family 3 patents of October 12, 2004.